Fisheries and Oceans Canada | Pêches et Océans Canada
Science | Sciences
Central and Arctic Region
Canadian Science Advisory Secretariat
Science Advisory Report 2011/009

IDENTIFICATION OF CONSERVATION OBJECTIVES AND BOUNDARY DELINEATION FOR THE DARNLEY BAY AREA OF INTEREST (AOI)

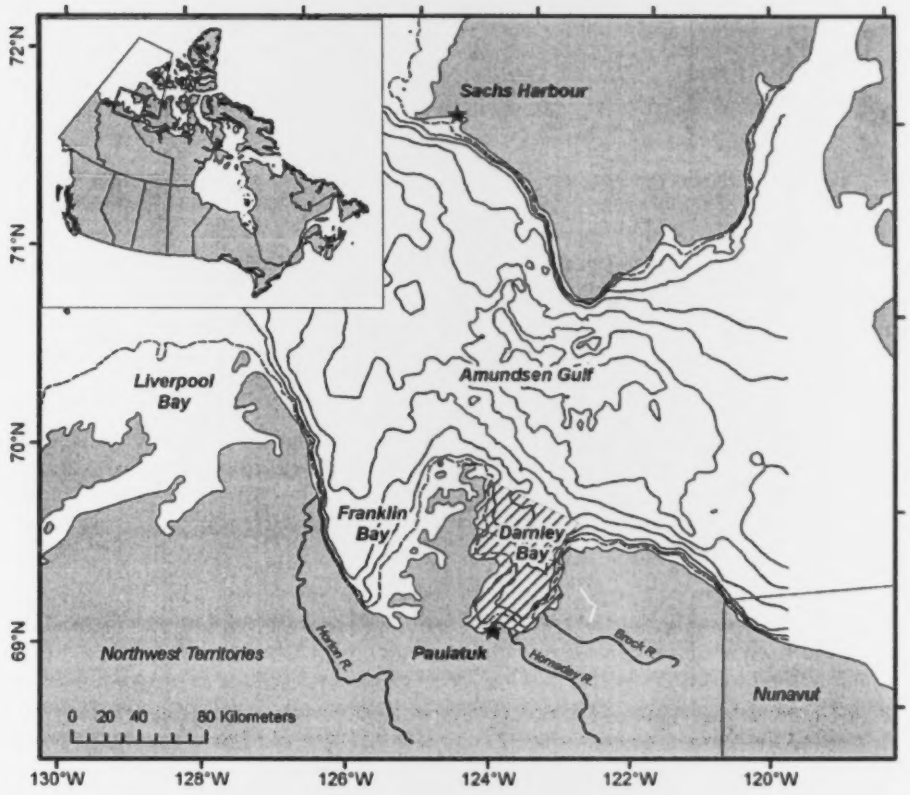

Figure 1. Ecologically and Biologically Significant Areas (EBSAs) identified within Darnley Bay. The blue hatch marks correspond to the Pearce Point EBSA. The red hatch marks correspond to the Hornaday River EBSA.

Context:

An Area of Interest (AOI) in Darnley Bay of the western Canadian Arctic is being considered for designation as a Marine Protected Area (MPA) under the Oceans Act. *The AOI was nominated based on the presence of two Ecologically and Biologically Significant Areas (EBSAs). Under the Health of the Oceans Initiative, Fisheries and Oceans Canada (DFO) Science is required to provide advice in support of the identification and prioritization of MPAs following the selection of an AOI. This Science Advisory Report is from the DFO Canadian Science Advisory Secretariat regional advisory meeting of December 8, 2010. It contains advice requested by DFO Oceans Programs Division on areas within the Darnley Bay AOI that warrant marine protection, and their conservation objectives and geographical boundaries.*

June 2011

Canada

SUMMARY

- The scope of the exercise included Darnley Bay and a portion of Amundsen Gulf. Although the focus was aquatic marine ecosystems, consideration was also given to seabirds, sea ducks and Polar Bears.
- Four areas were identified for marine protection, and conservation objectives (COs) developed for each, in the following order of priority.
  - Darnley Bay Nearshore Migration and Feeding Corridor to ensure the quality and quantity of nearshore habitat and estuaries, including overwintering channels and freshwater inputs, for Arctic Char.
  - Cape Parry Offshore Marine Feeding Habitat to maintain the integrity of the marine environment offshore of Cape Parry for the protection of staging sea ducks and feeding seabirds and marine mammals.
  - Darnley Bay Offshore Ice-edge Habitat to maintain the integrity of the Amundsen Gulf polynya and ice-edge ecosystem offshore of Darnley Bay for the protection of biological productivity and feeding habitat.
  - Kelp Beds to maintain the integrity of kelp bed communities in Argo and Wise bays and elsewhere in Darnley Bay.
- Belugas, Arctic Cod, Bearded Seals, Ivory Gulls and Polar Bears appear to play an important role in the Darnley Bay region and may benefit from protection of one or more of the priority areas.
- The science advice in this report is largely based on expert opinion as there is limited scientific knowledge available for the Darnley Bay area. There is likely more detailed local knowledge that should be considered by DFO Oceans in developing an MPA in the area.

BACKGROUND

Identification of Ecologically and Biologically Significant Areas (EBSAs) can call attention to areas that have particular ecological or biological significance to facilitate a greater-than-usual degree of risk aversion (DFO 2004). The Beaufort Sea Large Ocean Management Area (LOMA) is located in the extreme northwestern corner of the Canadian Arctic, and encompasses the marine portion of the Inuvialuit Settlement Region (ISR). In the LOMA, twenty EBSAs, including two in Darnley Bay (Figure 1), were identified through a series of science and community workshops (Paulic et al. 2009) using a comprehensive set of nationally accepted criteria (DFO 2004). Subsequently, an Area of Interest (AOI) was nominated in Darnley Bay, which includes portions of the Pearce Point EBSA (for bowhead and beluga whales and their habitat) and Hornaday River EBSA (for Arctic Char stocks and their habitat) (Figure 2). Both EBSAs were considered to be data deficient, except the nearshore coastal portion of the Hornaday River EBSA where Arctic Char are harvested and stocks are monitored and managed by the local community. Although there was sufficient traditional knowledge available to conclude the area is likely an EBSA, there was insufficient scientific information to complete the evaluation.

Under the Health of the Oceans Initiative, DFO Science sector has been asked to provide advice in support of the identification and development of Marine Protected Areas (MPAs) following the selection of an AOI. An ecological overview and assessment report (EOAR) was developed for the Darnley Bay AOI. It characterizes the ecology of the area and provides the basis for determining whether an MPA should be established within the nominated AOI. DFO Science was asked by DFO Oceans to undertake a review of the EOAR, identify and prioritize areas within the AOI which meet the criteria for marine protection under the *Oceans Act*, provide advice on boundaries for those areas and identify one or more conservation objectives for each.

Available scientific information for the AOI is limited, whereas some areas outside the AOI are known to have biologicai significance, especially for Arctic Char (*Salvelinus alpinus*). For that reason, the scope of the exercise was expanded beyond the current AOI boundaries to include all of Darnley Bay and a portion of Amundsen Gulf.

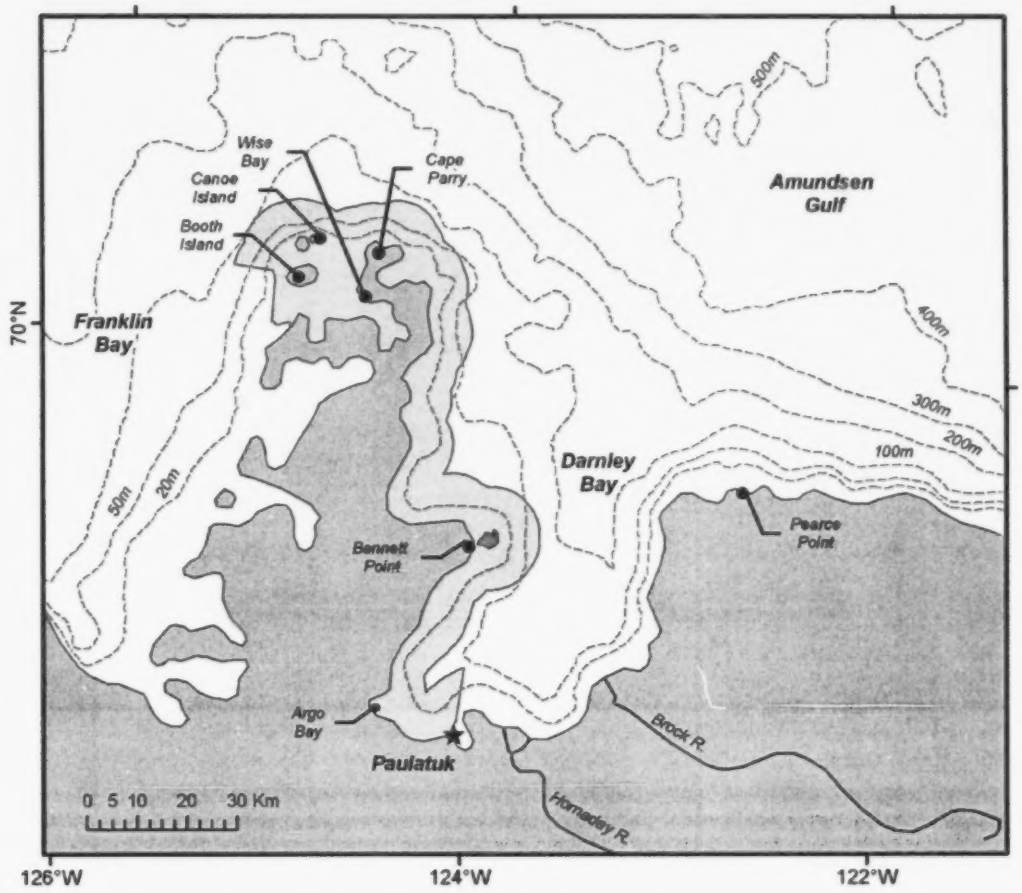

Figure 2. Map of Darnley Bay showing place names mentioned in the text and the AOI indicated by the blue shaded area.

ASSESSMENT

Key ecosystem components

The following key ecosystem components were identified based on current knowledge of the Darnley Bay area:

- Nearshore migration and feeding corridor for Arctic Char;
- Freshwater inputs from the Hornaday and Brock rivers;

- Deep holes in the channels within the Hornaday River estuary where Arctic Char overwinter;
- Seabird colony (Thick-billed Murres (*Uria lomvia*) and Black Guillemots (*Cepphus grille*)) unique to the Beaufort Sea LOMA and associated marine habitat;
- Sea duck staging area near Cape Parry and Booth and Canoe islands;
- Enhanced tidal flows at Cape Parry;
- Upwelling at Pearce Point and along the ice bridge across the mouth of Darnley Bay;
- Ice-edge habitat during spring; and
- Kelp beds, potentially unique to the Beaufort Sea LOMA, in Argo and Wise bays and perhaps elsewhere in Darnley Bay.

Several other features were also identified as possible key ecosystem components though conclusive scientific data are not currently available to confirm their importance:

- Belugas (*Delphinapterus leucas*) that appear to exhibit a distinct foraging strategy and may show fidelity to the area;
- Arctic Cod (*Boreogadus saida*), an Ecologically Significant Species (ESS) in the Beaufort Sea LOMA (Cobb et al. 2008);
- potentially important habitat for Bearded Seals (*Erignathus barbatus*) at Bennett Point and Cape Parry;
- potential presence of Ivory Gulls (*Pagophila eburnean*), a rare arctic seabird; and
- important sea-ice habitat for Polar Bears (*Ursus maritimus*).

The Darnley Bay region exhibits high inter-annual and temporal variability and is under significant change due to a warming Arctic climate. The current limited understanding of the structure and function of the ecosystem restricts our ability to identify areas for marine protection and associated conservation objective(s).

Priority area characterization, conservation objectives and boundary delineation

Limited scientific knowledge is available for the Darnley Bay area so advice about what areas warrant protection and their conservation objectives was based primarily on expert opinion. Four areas were identified. Their relative importance (priority level) was assigned according to available scientific knowledge and the potential for anthropogenic disturbance. They are presented below in decreasing order of importance.

Darnley Bay Nearshore Migration and Feeding Corridor

Arctic Char should be the primary focus of an MPA in Darnley Bay because the nearshore environment is critical for feeding and coastal migration of this species. Any associated environmental degradation in the area would likely have serious fitness consequences to Arctic Char populations in Darnley Bay. Arctic Char is an ESS in the Beaufort Sea LOMA as it is a major source of export/import of nutrients to/from the marine system.

Arctic Char are dependent on the warm, freshened marine waters near the Hornaday and Brock rivers and the availability of prey in the river estuaries. The preferred feeding habitat is typically within the 5-10 m water depth in the nearshore coastal environment. There are several meteorological and oceanographic conditions that can influence water mass movements within Darnley Bay and, consequently, the semi-passive movements of char and their prey (e.g.,

Capelin (*Mallotus villosus*)). As a result, Arctic Char can also be found in the freshened portion of the water column further from shore.

The nearshore environment within Darnley Bay is maintained by the freshwater inputs from the Hornaday and Brock rivers (Figure 3). These brackish waters are critical for the physiology of Arctic Char because although this species can tolerate high salinities, they must undergo a gradual salinity change in order to acclimatize their body to marine waters.

The Nearshore Migration and Feeding Corridor for Arctic Char in Darnley Bay should be given highest priority for protection. MPA boundaries for the corridor should be defined by the low-water mark to a water depth of 20 m, from the area indicated just north of Bennett Point to the area just east of Pearce Point, and include the brackish waters at the mouths of the Hornaday and Brock rivers (Figure 3). The defined area covers approximately 940 km^2 and is based on tagging data and habitat similarities. The conservation objectives for this area are as follows.

> *To ensure the quality and quantity of the nearshore environment, to a maximum water depth of 20 m, and estuaries are maintained in order to conserve and protect the feeding and migratory pathways of Arctic Char populations adjacent to their freshwater breeding habitat in the Hornaday and Brock rivers.*
>
> *To ensure the quality and quantity of overwintering Arctic Char habitat in the channels of the Hornaday River delta are not disturbed by human activities.*
>
> *To ensure the quality and quantity of freshwater inputs from the Hornaday and Brock Rivers are maintained within the range of natural variability.*

The conservation objectives are phrased in a manner which places emphasis on the importance of ensuring no physical obstruction(s) are created which would either a) create physical barriers along the coastal migration route or b) disturb the natural distribution of brackish waters. Management should also consider human activities occurring upstream in freshwater in order to achieve the COs.

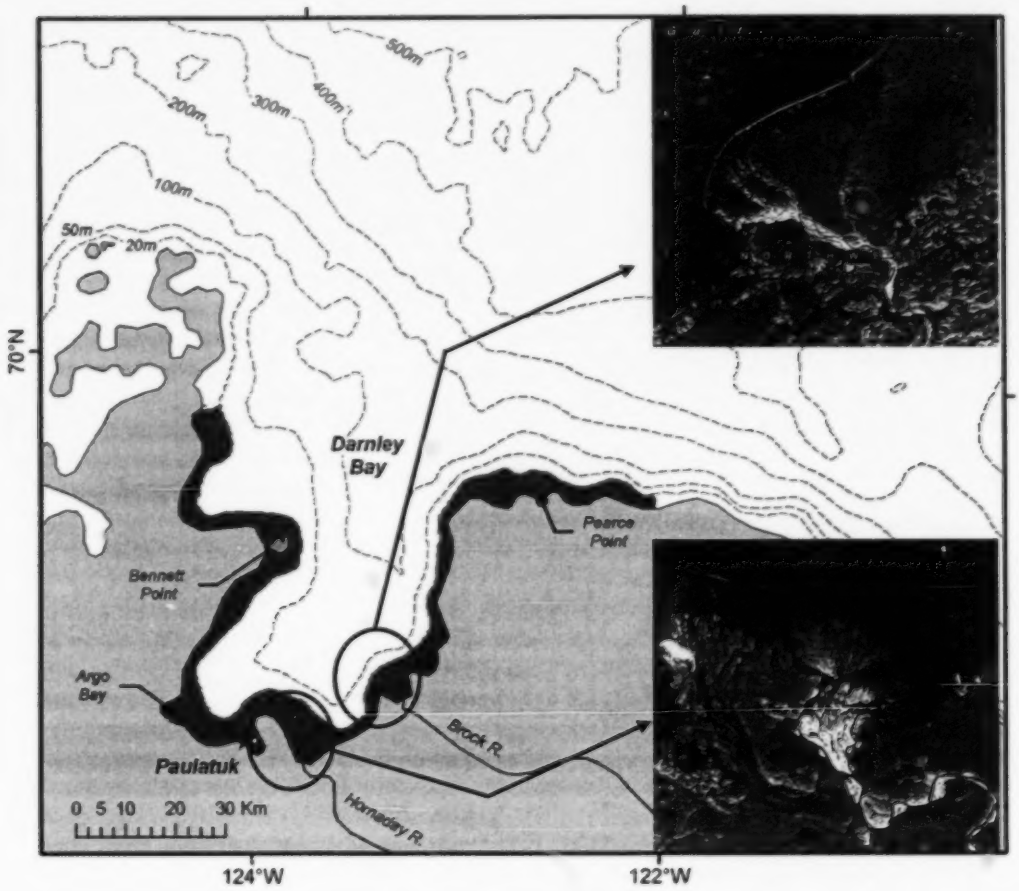

Figure 3. Darnley Bay Nearshore Migration and Feeding Corridor is the highest priority area recommended for the protection within Darnley Bay. It would provide Arctic Char with important feeding and migratory routes adjacent to freshwater breeding habitats. Inset maps show detailed estuary images for the Brock (top) and Hornaday (bottom) rivers.

Cape Parry Offshore Marine Feeding Habitat

The marine habitat adjacent to Cape Parry is an area of high productivity. The marine currents, tides and the variable bathymetry result in upwellings that produce a rich marine environment. These waters provide important habitat for a number of species. During late winter and spring the polynya/sea-ice edge is used by marine mammals as a structural platform for hunting/feeding (e.g., Polar Bears, Ringed and Bearded Seals), or as a feature where preferred prey typically aggregate and provide important feeding areas for other key species (e.g., Beluga, Bowhead (*Balaena mysticetus*)). The polynya/sea-ice edge is also an important staging area used by sea ducks. In late spring to early summer, during the open-water season, there also appears to be an abundance of key prey species for higher trophic level foraging (e.g., seabirds, Beluga). This offshore marine feeding habitat supports a unique seabird nesting area for Thick-billed Murres and Black Guillemots at the Cape Parry Migratory Bird Sanctuary (MBS). In late summer, King Eider (*Somateria spectabilis*) and Common Eider (*Somateria mollissima*) use the marine waters as a staging and moulting area.

The polynya and sea-ice habitat off Cape Parry should be given second highest priority for protection. Limited scientific data are currently available for this region on which to base the exact boundaries of the proposed area. In the eastern Canadian Arctic, seabirds travel a median distance of 30 km from their nests to feed. Seabirds at Cape Parry may travel similar distances between their colonies and feeding areas (Mallory and Fontaine 2004). Assuming the protected area should be sufficiently large to accommodate the oceanographic and ecological processes that produce the rich marine environment there, as well as the species that depend on it, the recommended area should be at least 30 km in radius, centred on Cape Parry (Figure 4). The defined area covers approximately 3,000 km^2. The conservation objective for this area is as follows.

> *To maintain the integrity of the marine environment offshore of the Cape Parry MBS so that it is productive and allows for higher trophic level feeding by ensuring that the Cape Parry polynyas and associated sea-ice habitat, and the role of key prey species (e.g., Arctic Cod), are not disrupted by human activities.*

Anthropogenic disturbance can cause increases or decreases in prey abundance, changes in spatial or seasonal distribution, and other kinds of alterations that can have ecological consequences for the entire ecosystem. Human activities that disrupt the physical integrity of the polynya and associated sea-ice during winter and spring could negatively affect the "pre-conditioning" processes that contribute to marine productivity in the area. In addition to the concerns around ice-breaking, ships produce noise and could cause contaminant spills.

Seabirds nesting on the cliffs at the Cape Parry MBS rely on prey from the offshore marine environment for the survival of their offspring (Mallory and Fontaine 2004). Marine birds are known to be reliable and efficient samplers of the marine environment so they are a useful tool to assess the integrity of the ecosystem. The Cape Parry bird colony is unique to the LOMA thus failure to maintain breeding at this location would negatively affect biodiversity in the region and signal a decline in the integrity of the ecosystem.

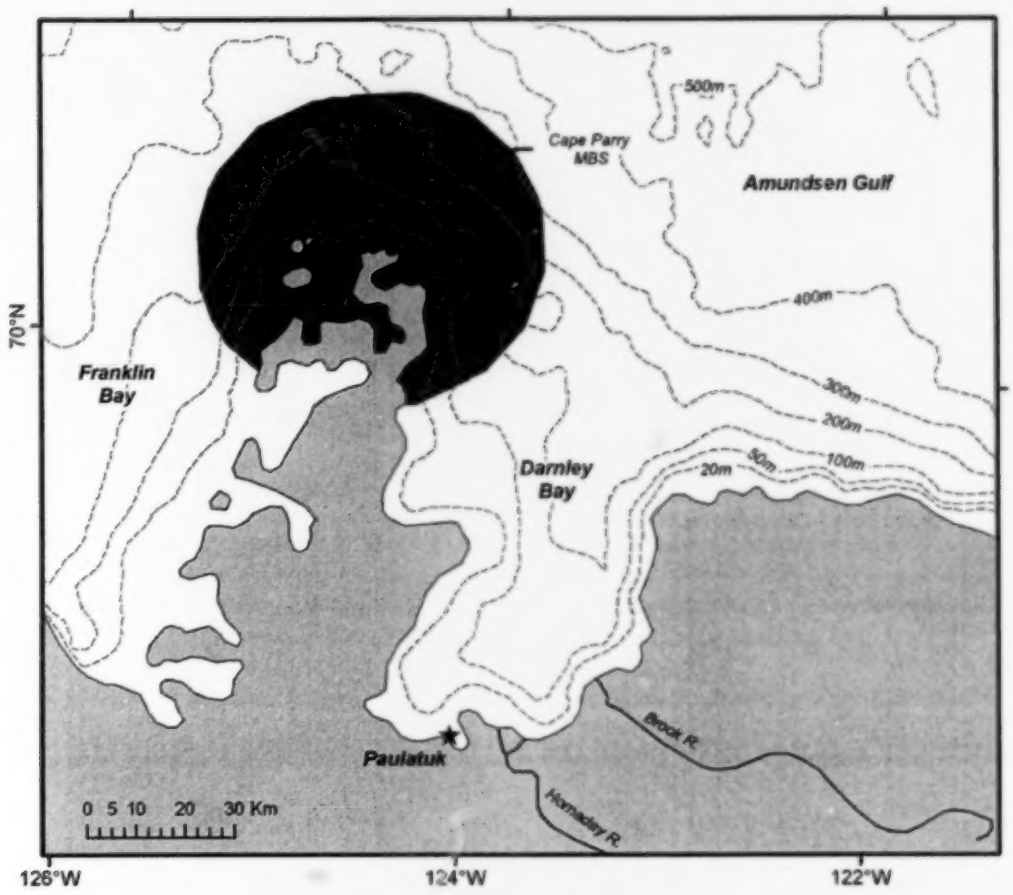

Figure 4. Cape Parry Offshore Marine Feeding Habitat is the second highest priority area recommended for protection. Maintaining ecosystem productivity and marine feeding in these offshore waters is a conservation priority in order to maintain the existence of the unique seabird colonies nesting at the Cape Parry Migratory Bird Sanctuary (MBS). This rich marine environment also supports other higher-trophic species (e.g., Belugas).

Darnley Bay Offshore Ice-edge Habitat

The Amundsen Gulf polynya and associated flaw lead system is a highly productive area offshore of Darnley and Franklin bays during late winter to spring. It drives productivity in the region and includes fast-ice edges at the mouths of both bays. Upwelling resulting from favourable winds along the sea-ice edge can cause aggregations of prey and their predators (e.g., Belugas, Bowhead, Arctic Cod). For this reason, the ice-edge habitat offshore of Darnley Bay (Figure 5) warrants protection.

The boundaries for this area were determined based on the approximate location of the fast-ice edge (CIS 2002) and observations made during bowhead aerial surveys conducted in the region. The boundaries for this area are dynamic and difficult to define since there is a high degree of inter-annual and seasonal variability. The defined area covers roughly 5,500 km^2. The conservation objective for this area is as follows.

To maintain the integrity of the Amundsen Gulf polynya and ice-edge ecosystem offshore of Darnley Bay by ensuring that the ice-edge is not disrupted by human activities.

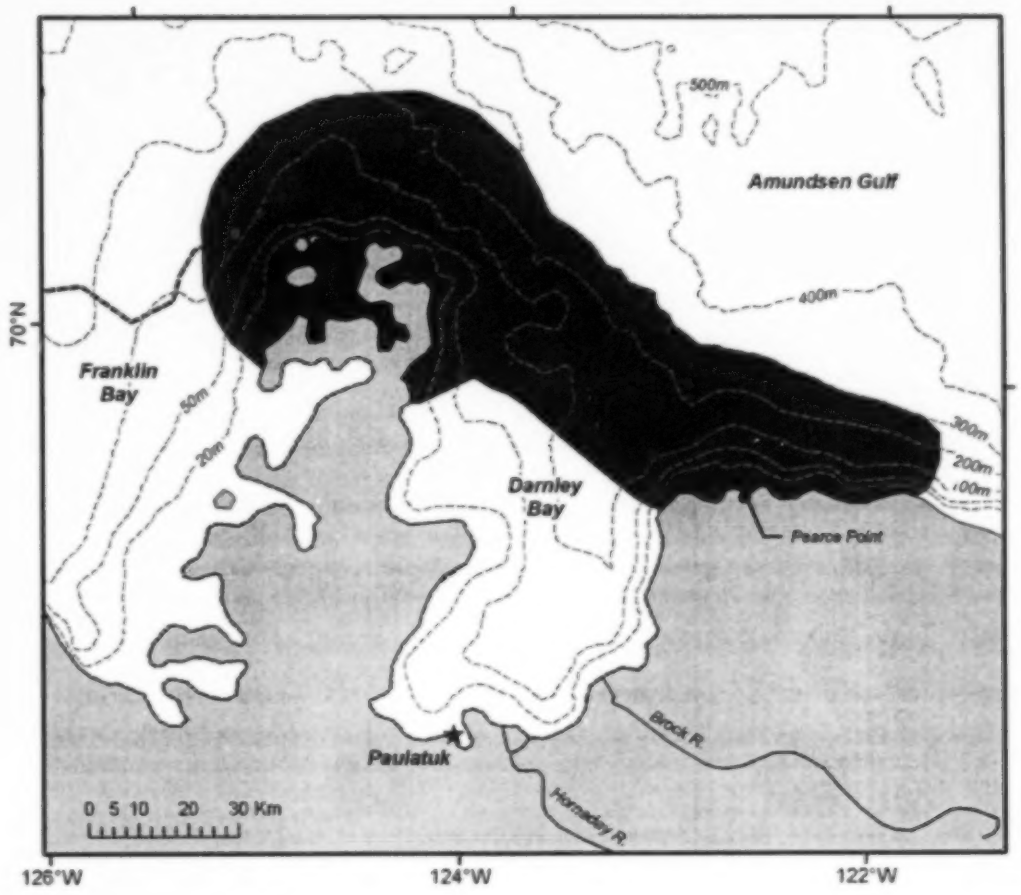

Figure 5. The Darnley Bay Offshore Ice-edge Habitat is recommended for protection. Maintaining ecosystem productivity and marine feeding in these offshore waters is a conservation priority in order to maintain foraging areas for a number of key species. Dashed line shows approximate location of the fast-ice edge (CIS 2002).

Kelp Beds

Traditional knowledge indicates there are kelp beds near Argo Bay and in Wise Bay (Figure 2) and suggests there may be others that exist along the coastline of Darnley Bay. In the Beaufort Sea LOMA no other areas with kelp have been identified, although kelp beds may exist in Liverpool Bay and near Sachs Harbour. The closest comparison is in Alaska at Stefansson

Sound (Boulder Patch) and areas within the Canadian Eastern Arctic (e.g., Resolute, Igloolik). Kelp beds are known to fulfill many diverse habitat functions in other coastal oceans, providing three-dimensional space, protection and food for potentially unique and/or diverse communities. They may also serve as important spawning habitat or nursery areas for juvenile life stages for some species of fishes.

Areas within Darnley Bay that contain kelp beds would warrant protection due to their uniqueness or rarity. Boundaries can be proposed once kelp beds have been identified or confirmed and mapped. The conservation objective for these areas is as follows.

To maintain the integrity of kelp beds within Darnley Bay by ensuring they are not disrupted by human activities.

Other possible key ecosystem components

Several additional species in the Darnley Bay area, that appear to play an important role in the ecosystem, may benefit from protection of one or more priority areas previously identified.

Beluga

Satellite tagging of Belugas has confirmed that animals migrate through Amundsen Gulf in a clockwise pattern, moving west past Cape Parry during the month of August. Residents from the local community of Paulatuk report that Belugas use Brown's Harbour, Letty Harbour and Argo Bay between late July and late September. It is unclear what the Belugas are doing when they move into Darnley Bay, but they are thought to be feeding and possibly moulting in Argo Bay. Although the aggregation of Belugas in Darnley Bay is not unique within the Beaufort Sea LOMA, these whales are typically smaller animals that prefer open-water and may have a different foraging strategy than the larger males that prefer ice-covered waters. A genetic study is underway to examine kinship groups within the Beaufort Sea Beluga population to determine if the animals that return annually to harvesting areas in the LOMA are from the same families. If the findings are confirmed this would support the development of an additional conservation objective for Beluga in the Darnley Bay Nearshore Migration and Feeding Corridor (Figure 3).

During spring surveys, Bowheads and Belugas were observed diving at the Franklin Bay ice-edge. In years of low pack ice Belugas were located along the ice-edge, while in other years they are distributed throughout the ice. These observations in Franklin Bay suggest there may be prey aggregations under the ice-edge in spring which may also be the case along the Darnley Bay ice-edge and therefore marine protection of the Cape Parry Offshore Marine Feeding Habitat and the Darnley Bay Offshore Ice-edge Habitat (Figures 4 and 5) could benefit Belugas in spring.

Arctic Cod

Arctic Cod are considered to be ubiquitous in the Canadian Arctic though their distribution and abundance have not been studied in Darnley Bay. They are an ESS in the Beaufort Sea LOMA and are considered a fundamental component of a well functioning Arctic ecosystem. Arctic Cod have seasonal patterns of habitat use. For example, in spring they use the stable or semi-stable ice-edges across Darnley Bay and the ice-edges in Amundsen Gulf. For these reasons, marine protection of the Cape Parry Offshore Marine Feeding Habitat and the Darnley Bay Offshore Ice-edge Habitat (Figures 4 and 5) could benefit Arctic Cod and predators that rely on them.

Bearded Seal

Scientific studies on the population structure, abundance or productivity of Bearded Seals in the Beaufort Sea LOMA are limited. In Darnley Bay, traditional knowledge has identified important Bearded Seal habitat at Bennett Point and Cape Parry. Marine protection of the Darnley Bay Nearshore Migration and Feeding Corridor, the Cape Parry Offshore Marine Feeding Habitat and the Darnley Bay Offshore Ice-edge Habitat (Figures 3-5) could benefit Bearded Seals.

Ivory Gull

There are no confirmed sightings of the Ivory Gull in Darnley Bay – Amundsen Gulf. However, this species is known to feed along ice-edge habitats in the high Arctic (COSEWIC 2006), so it is suspected they may use the Amundsen Gulf polynya and flaw leads. Ivory Gull is listed as an Endangered species under the *Species at Risk Act* (SARA) and as At Risk under the General Status Ranks of Wild Species in the Northwest Territories (2006-2010). Marine protection of the Cape Parry Offshore Marine Feeding Habitat and the Darnley Bay Offshore Ice-edge Habitat (Figures 4 and 5) could benefit Ivory Gulls.

Polar Bear

Polar Bears utilize a variety of sea-ice types, from stable fast-ice with drifted pressure ridges to areas near the floe edge and moving active ice. In late winter and spring the densities of Polar Bears in the Beaufort Sea are highest near the floe edge and in areas of moving active ice than any other habitat (Stirling et al. 1993). This area is important for spring feeding for Polar Bears and also appears to be an area where adult males and females mate. Traditional and scientific knowledge have identified areas offshore of Pearce Point and Canoe and Booth islands near Cape Parry as important for Polar Bears in spring. This species has been designated as Special Concern by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC 2008); a SARA listing decision is forthcoming. Marine protection of the Cape Parry Offshore Marine Feeding Habitat and the Darnley Bay Offshore Ice-edge Habitat (Figures 4 and 5) could benefit Polar Bears.

Data and knowledge gaps

Current knowledge of the Beaufort Sea Shelf was used to draw inference where information was limited for Darnley Bay. Further study and analysis is needed in order to develop baseline knowledge on the following:

- wind patterns (i.e., occurrence of upwelling-favourable winds), water current patterns, tides (e.g., degree of vertical mixing caused by tidal patterns), freshwater inputs and areas of upwelling, freshwater retention in Darnley Bay;
- deep water mass movements in Amundsen Gulf on a seasonal basis;
- extent and inter-annual variation of the freshwater plume from the Hornaday River during summer and winter;
- detailed bathymetry of Darnley Bay;
- morphological changes in the estuary channels of the Hornaday River;
- ice-scouring, ice-ridging and sea-ice habitat type in Darnley Bay;
- detailed information on the location of the 'deep-holes' in the Hornaday River and the degree to which Arctic Char use and rely on them as overwintering habitat;
- Arctic Char summer feeding habitat

- abundance, distributions and habitat use of fishes;
- locations of Capelin aggregations and description of their ecology (e.g., spawning locations);
- diet and range of feeding from the colony for Thick-billed Murres and Black Guillemots at the Cape Parry MBS;
- location and ecological significance of kelp beds;
- abundance and genetic relationships of Belugas in Darnley Bay and more specifically in Argo Bay and how and why they use that area; and
- abundance, distribution, diet and habitat use of Darnley Bay by Bearded Seals.

CONCLUSIONS

The review of the EOAR for Darnley Bay and the formulation of COs based on this information is an important step leading to the development of a MPA. The COs and the associated boundaries were developed based on current scientific knowledge. The delineation of boundaries is meant to support the development of MPAs. Ideally, it should be possible to select appropriate monitoring indicators and reference points from the COs described here. However, limited scientific knowledge of the Darnley Bay area made it difficult to select appropriate areas, delineate boundaries and formulate COs. There is likely more detailed local knowledge that should be considered by DFO Oceans Programs Division in developing an MPA in the area.

The scope of the exercise included Darnley Bay and a portion of Amundsen Gulf because some areas outside the AOI are known to have biological significance, and there is limited scientific information available for the AOI. Seabirds, sea ducks and Polar Bears were also considered, although the primary focus was aquatic marine ecosystems for which DFO has responsibility. Four areas were identified for marine protection (in decreasing order of priority): (1) Darnley Bay Nearshore Migration and Feeding Corridor, (2) Cape Parry Offshore Marine Feeding Habitat, (3) Darnley Bay Offshore Ice-edge Habitat and (4) Kelp Beds. Geographical boundaries and COs were identified for each area. Belugas, Arctic Cod, Bearded Seals, Polar Bears, and possibly Ivory Gulls, appear to play an important role in the Darnley Bay region and may benefit from protection of one or more of the priority areas.

The EOAR and the COs developed at this advisory meeting should be re-evaluated periodically to ensure that new knowledge on ecosystem functions and on significance of areas and/or species can be appropriately considered.

SOURCES OF INFORMATION

This Science Advisory Report is from the Fisheries and Oceans Canada, Canadian Science Advisory Secretariat, regional advisory meeting of December 8, 2010 on the Identification of Conservation Objectives and Boundary Delineation for the Darnley Bay Area of Interest. Additional publications from this process will be posted as they become available on the DFO Science Advisory Schedule at http://www.dfo-mpo.gc.ca/csas-sccs/index-eng.htm.

Canadian Ice Service (CIS). 2002. Sea Ice Climatic Atlas Northern Canadian Waters 1971-2000, Ottawa, Ont., En56-173/2002.

Cobb, D.G., Fast, H., Papst, M.H., Rosenberg, D., Rutherford, R., and Sareault, J.E. 2008. Beaufort Sea Large Ocean Management Area: Ecosystem Overview and Assessment Report. Can. Tech. Fish. Aquat. Sci. 2780. ix + 188 p.

COSEWIC. 2006. COSEWIC assessment and update status report on the Ivory Gull *Pagophila eburnea* in Canada. Committee on the Status of Endangered Wildlife in Canada. Ottawa. vi + 42 p.

COSEWIC. 2008. COSEWIC assessment and update status report on the Polar Bear *Ursus maritimus* in Canada. Committee on the Status of Endangered Wildlife in Canada, Ottawa. vii + 75 p.

DFO. 2004. Identification of Ecologically and Biologically Significant Areas. DFO Can. Sci. Advis. Sec. Ecosystem Status Rep. 2004/006.

DFO. 2007. Guidance document on identifying conservation priorities and phrasing Conservation Objectives for Large Ocean Management Areas. DFO Can. Sci. Advis. Secr., Sci. Advis. Rep. 2007/010.

Mallory, M.L., and Fontaine, A.J. 2004. Key marine habitat sites for migratory birds in Nunavut and the Northwest Territories. Occas. Paper No. 109. Canadian Wildlife Service, Environment Canada, Ottawa, ON.

Paulic, J.E., Papst, M.H., and Cobb, D.G. 2009. Proceedings for the identification of Ecologically and Biologically Significant Areas in the Beaufort Sea Large Ocean Management Area. Can. Manuscr. Rep. Fish. Aquat. Sci. 2865: ii + 46 p.

Stirling, I., Andriashek, D.A., and Calvert, W. 1993. Habitat preferences of Polar Bears in the western Canadian Arctic in late winter and spring. Polar Rec. 29:13–24.

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ISSN 1919-5079 (Print)
ISSN 1919-5087 (Online)
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CORRECT CITATION FOR THIS PUBLICATION

DFO. 2011. Identification of Conservation Objectives and Boundary Delineation for the Darnley Bay Area of Interest (AOI). DFO Can. Sci. Advis. Sec. Sci. Advis. Rep. 2011/009.